Regional Operational Plan SF.2A.2014.07

Buskin River Sockeye and Coho Stock Assessment Operational Plan, 2014-17

by

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And

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June 2014

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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by

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Project Title:	**Buskin River Sockeye and Coho Stock Assessment Operational Plan, 2014-17**
Project leader(s):	**Tyler B. Palum Fishery Biologist II** Tyler H. Dann Fisheries Geneticist II
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Approval

Title	Name	Signature	Date
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Project leader	Tyler H. Dann		6/6/14
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INTRODUCTION

The Buskin River (Figure 1), located approximately 2 miles from the city of Kodiak, is the most heavily fished drainage in the Kodiak Regulatory Area, with a recent 10-year annual average of 16,360 angler-days. Recreational fishing effort on the Buskin River is directed primarily toward coho salmon *Oncorhynchus kisutch* and sockeye salmon *O. nerka*, but also pink salmon *O. gorbuscha*, steelhead and rainbow trout *O. mykiss,* and Dolly Varden *Salvelinus malma*. Subsistence and commercial fisheries in the marine waters surrounding Kodiak Island also harvest Buskin River salmon.

Harvests and escapement of sockeye salmon returning to the Buskin River have been monitored annually by ADF&G since 1980. Prior to 1985, escapement of sockeye salmon was indexed using aerial survey counts; since then a weir has been used to monitor the total escapement. Between 2004 and 2013, sockeye salmon escapements into Buskin Lake have averaged 13,192 fish, ranging from 5,900 in 2008 to 22,023 in 2004. Reported subsistence harvests have averaged 5,524 (2004-2012) and sport harvest averaging 1,216 (2004-2012) (Polum and Evans, in prep). Recreational fishing effort on the Buskin River has represented 33% of total annual freshwater recreational fishing effort in the Kodiak Management Area over the last 10 years (Polum and Evans, in prep). Commercial harvests of Buskin River sockeye salmon have been small, totaling less than 50 fish harvested annually during all but one year between 2004 and 2013 (Westward Region CF Database).

Lakes Louise and Catherine are on a tributary of the Buskin River (Figure 1) and support a smaller run of sockeye salmon. ADF&G has operated a weir at the outlet of Lake Louise since 2002 and the average weir count through 2013 is about 1,900 and represents on average about 10% of the escapement through the Buskin Lake weir; this proportion is variable annually, ranging from 21% in 2006 to 3% in 2011. The sockeye salmon run to Lake Louise has been later than that to Buskin Lake. This observation could be due an inherent later run of Louise sockeye salmon, or due to low water levels in the small tributary leading to the lake holding up passage. It has also been assumed that the subsistence fishery primarily targets the sockeye salmon run to Buskin Lake. This question was addressed in the 2010-13 cycle of this project where genetic samples were collected from sockeye harvested in the subsistence fishery. Lake Louise sockeye were found to make up a very small portion of the harvest (ranging from 0.1%-6.4%), and our assumption of low harvest of Louise fish seems appropriate. The low harvest of Lake Louise sockeye salmon in 2010-2013 is likely due to the low Louise lake run during this period, but other factors, such as late run-timing or the smaller size of the fish of this stock preventing their capture may also be involved. We will continue to address the assumption that the subsistence fishery does not harvest a large number of Lake Louise fish in this study through genetic sampling of the subsistence harvest.

In river returns of coho salmon to the Buskin River have averaged about 9,200 fish from 2004-2013, while reported subsistence harvests averaged roughly 1,078 fish from 2004-2012 and sport harvests averaged approximately 4,170 fish from 2004-2012. Commercial harvests of coho salmon attributed to the Buskin River run have averaged 250 from 2004-2013 (Westward Region CF Database).

Outcomes from this project will ensure that maximum harvest opportunities for Buskin River sockeye and coho salmon are achieved concurrent with long term sustainability of the stocks.

Brood tables using data collected by this project will be updated and the biological escapement goal (BEG) for sockeye and coho salmon will be updated.

OBJECTIVES AND TASKS

The overarching goal of this project is to evaluate the BEG for Buskin River sockeye and the BEG for coho salmon. To reach this goal, total return by age will be constructed from estimates of age composition, escapement and harvests. Specific objectives relating to the components needed for this goal are as follows:

SOCKEYE SALMON

Objectives

1. Census the sockeye salmon escapement into Buskin Lake approximately from June 1 to August 1, and Louise/Catherine lakes tributary approximately from June 1 through August 31.
2. Estimate the age composition of the sockeye salmon run (combined subsistence harvest in the Chiniak Bay section and escapement[a]) to Buskin Lake such that the estimates are within 7.5 %[b] of the true value 95% of the time[c].
3. Estimate the age composition of the sockeye salmon run (escapement) to Louise/Catherine lakes tributary such that the estimates are within 15%[b] of the true value 90% of the time[c].
4. Estimate proportions (through DNA analysis) of the sockeye salmon subsistence harvest in the Buskin River Section of Chiniak Bay comprised of Buskin and Louise/Catherine lakes run components such that the estimates are within 7.5% of the true value 90% of the time[c].

[a] It is assumed the Lake Louise stock does not contribute appreciably to the subsistence harvest (see previous operational plans for details). See Objective 4 for a test of this assumption.

[b] Steve Fleischmann, Alaska Dept. of Fish and Game, Anchorage has shown that there is little gain in the precision of the estimate of escapement for maximum sustainable yield once 100 ages have been sampled from a stock in a given year. This study will sample more than 100 ages from the Buskin Lake stocks under the specified precision criteria; the increases in sample sizes beyond 100 will allow us to additionally compare age compositions among sources (Buskin Lake escapement, Lake Louise escapement and subsistence harvest), and will help in the practicalities of obtaining representative samples.

[c] 'Within d% of the true value A% of the time' implies: $P(p_i - d \le \hat{p}_i \le p_i + d) = A/100$ for all i, where p_i denotes population age proportion for age class i

Secondary Objectives

1. Estimate sex composition and mean length at age of subsistence harvest and sockeye salmon escapement to Buskin Lake.

2. Estimate sex composition and mean length at age of the sockeye salmon run to Louise/Catherine lakes tributary.
3. Record residency of Buskin drainage subsistence users, document traditional areas of subsistence harvest and duration of harvest in those areas; the survey will be conducted during age-sex-length sampling of the subsistence harvest.
4. Compare age-sex compositions and length at age among sockeye salmon from Buskin Lake and Louise/Catherine lakes tributary escapements and subsistence harvest.
5. Annually hire two high school student interns for employment with ADF&G working on the Buskin River project from June 1 through July 31.

COHO SALMON

Objectives

1. Objectives: Census coho salmon inriver return to Buskin River from August 1 to September 30.
2. Estimate age composition of coho salmon in the Buskin River escapement such that estimates of the proportions of age 1.1, 2.1 and 3.1 fish are within 7.5 percentage points of the true value 95% of the time.

Secondary Objectives

1. Estimate sex composition and mean length at age of the coho salmon in the Buskin River escapement.

STUDY DESIGN AND DATA COLLECTION

SOCKEYE SALMON

Run Size Estimation

Buskin Lake Escapement

Escapement will be censused through a weir at the outlet of Buskin Lake. Dates of weir operation will be May 16 to September 30. Based on escapement timing over the last ten years, 88% of the migration into Buskin Lake is anticipated to occur by August 1. The weir is kept operational to monitor coho salmon into Buskin Lake after the end of the sockeye run.

Lake Louise Escapement

Escapement into Louise/Catherine lakes, via a tributary of the Buskin River, will be censused; a weir will be operated from June 1 through September 15. The lower weir located on the Buskin River main stem below the Louise/Catherine lakes tributary will be installed on August 1 to primarily allow counting of early coho salmon migrants.

Daily counts for each weir will be entered on the salmon weir count form (Appendix A1). Completed daily count forms will be maintained at the weir and at the Kodiak SF Division office. Fish traps used to sample escapement into Buskin Lake and Lake Louise for ASL will be operational beginning June 1 (Appendices A2 and A4). Fish will be enumerated as they are released from the trap and added to daily weir counts.

Subsistence Harvest

Historically, subsistence fishing in marine waters near the mouth of the Buskin River has accounted for a vast majority of the sockeye salmon harvest. The subsistence harvest will be estimated from returns of completed permits received at the Kodiak CF Division office. Annual return rates of completed permits have averaged 90% in the past 10 years and past estimates have therefore been minimal since unreturned permits remain unaccounted for. At present it is not possible to adequately determine the proportion of permit holders harvesting Buskin River sockeye salmon who annually fail to return permits. Harvest rates for unreturned permits have been studied for other permit fisheries in Alaska (e.g. Kenai Peninsula sockeye salmon dipnet fishery), and we will use these rates to adjust subsistence harvests when developing brood tables.

Sport Harvest/Commercial Harvest

The sport harvest will be estimated by the Statewide Harvest Survey and the (small) commercial harvest will be tallied from fish sales receipts.

Age-Sex-Length (ASL) Sampling

Buskin Run Sample Sizes

Objective 2 pertains to the age composition of the overall sockeye salmon run to Buskin Lake. The sample size giving the prescribed precision of estimates of the proportion by age of the overall run was calculated using a Monte Carlo simulation. Sampling from the subsistence harvest and weir populations were each simulated by the multinomial distribution. Subsistence and Buskin Lake weir multinomial parameter vectors were set to historical age composition estimates of the subsistence harvests and escapement, respectively. A range of paired sample sizes was considered, each consisting of the number sampled at the weir and the number sampled from the subsistence harvest. Sampling was simulated 3,000 times for each candidate pair of sample sizes, and the overall age composition (four age classes: 1.2, 1.3, 2.2 and 2.3) calculated for each of the 3,000 simulations as described in the Data Analysis section (for pooled data for each of the escapement and subsistence strata). The weighting used for the subsistence and weir compositions were based on historical weir and harvest data. The value 'd' was determined empirically for each sample size pair such that for all i:

$$P(p_i - d \le \hat{p}_i \le p_i + d) = 0.95$$

where $\hat{p}_i$ is the simulated proportion of age class i and p_i is the assumed proportion of age class i in the overall population. A sample size pair was chosen that was dictated by objective criteria, and beyond that total sample size (which favors sampling at the weir, versus from the subsistence harvest), and rounding up, to facilitate field work and accounting for temporal stratification of the estimates.

Buskin Lake Escapement Sample Size

To achieve prescribed relative precision, and allowing for a 10% scale regeneration rate, Kodiak SF Division personnel will sample a total of 300 sockeye salmon from the weir at the Buskin Lake outlet weir sampling box over the four temporal strata (June 1-15, June 16-30, July 1-15 and July 16-end of sockeye run). Escapement sampling over the last five years at

the Buskin Lake outlet weir has yielded sample sizes that comprise on average 99% of the goal of 300.

Ideally, sampling will be done on two days, one week apart, during each stratum. Sampling intensity will reflect historical run timing to the Buskin Lake outlet weir. A total of 60 fish each on 6 and 13 June, 50 fish each on 20 and 27 June, 30 fish each on each 4 and 11 July, and 20 fish will be sampled each on 19 and 26 July. The total of 320 fish exceeds the required sample size. Tally sheets will be completed to monitor progress toward the attainment of weekly sample goals (Appendix A2).

Subsistence Harvest Sample Size

The subsistence harvest will also be sampled for age/sex but to a lesser degree than the Buskin River escapement, as a consequence of the subsistence harvest being smaller than the escapement. For 2014-2017, the total sample size of 200, (allowing for 10% scale regeneration) will be divided among two strata. These strata will be June 1-15 and June 16-30, such that 100 fish are sampled from each stratum**.** The Project Manager will closely monitor the 2014-2017 sample effort to ensure sampling goals are attained. Sampling will be conducted on the fishing grounds with a boat during good weather, and alternatively dockside at the local boat harbor. Harvested fish will be sampled from permit holders opportunistically within each time interval. A tally sheet will be completed to monitor progress toward weekly sample-size goals (Appendix A3).

Louise/Catherine Lakes Escapement Sample Size

Objective 3 pertains to the age composition of the overall sockeye salmon run to Louise/Catherine lakes. In the last 4 years we have failed to sample the 250 fish specified in the 2010-2013 operational plan, averaging only 43 fish annually. Small and late runs and high water have prevented us from sampling the specified number of fish. We have reduced the expected precision for the age composition estimates specified in the objective 3 criteria, with resulting sample sizes, calculated according to Thompson (1987) being more reflective of the reality of the sampling situation. Although the precision of our estimates will be lower, we believe they will still serve as a useful baseline for the Louise/Catherine lakes sockeye salmon population. To achieve prescribed relative precision, and allowing for a 10% scale regeneration rate, and using a finite population correction factor that assumes a run of 600 (5 year average), Kodiak SF Division personnel will sample a total of 60 sockeye salmon from the Lake Louise weir sampling box over the four temporal strata (June 1-July 15, July 16-31, August 1-15 and August 16-31).

Ideally, sampling will be done on two days during each stratum. Sampling intensity will reflect historical run timing data to the Lake Louise outlet weir. The run to the Louise/Catherine lakes system weir is sporadic and historical run-timing data was averaged over years for which the last 5 days of monitoring represented less than 5% of the total run (2004, 2005, 2007, 2008 and 2011). A total of 5 fish will be sampled each on about 15 and 30 June, 5 each on about 21 and 26 July, 15 each on 6 and 11 August, and 15 fish will be sampled each on 19 and 26 August. The total of 80 fish exceeds the required sample size. Tally sheets will be completed to monitor progress toward the attainment of weekly sample goals (Appendix A4). Should the Louise/Catherine lakes sockeye salmon run materialize as a larger run and in a more uniform and accessible manner than it has done in the last 4 years,

then the sample sizes and sampling regimen described in the 2010-2013 Buskin River plan will be used.

Because the sockeye salmon run is comparatively small, and, accordingly, the daily escapement often modest or sporadic, more than one day may occasionally be required to attain weekly sample goals. All fish entering the trap on selected days will be sampled, even if the daily sample goal is exceeded. If large numbers (> 100) of sockeye salmon are present behind the weir, fish will be sampled during the early, middle and late portions of the time interval required for their passage upstream. If escapement into Lake Louise occurs earlier than the five -year run-timing estimate suggests it will, inseason adjustment of the sampling schedule outlined in Appendix A4 will be required.

ASL Sampling Methodology

Sampled fish length will be measured from mid-eye to fork-of-tail to the nearest millimeter (mm). Sex will be identified based on external morphology and sexual characteristics. Sex and length data will be recorded on an Aceeca™ Meazura MEZ1000 (RDA) (Appendix B5) and downloaded into a Microsoft Access database (Appendix B6) following completion of each day of sampling. Two scales will be taken from each fish and mounted on a gum card. The scales will be taken from the left side of the body, at a point on a diagonal line from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin, two rows above the lateral line (Clutter and Whitesel 1956). Scales will be taken proximal to the preferred region when necessary, although only within the area bounded dorsally by the fourth row of scales above the lateral line, ventrally by the lateral line, and between lines drawn vertically from the posterior insertion of the dorsal fin and the anterior insertion of the anal fin. (If no scales are available in the preferred region on the left side of the fish, scales will be collected from the preferred region on the right side.) Age will be interpreted from the scales using the criteria of Clutter and Whitesel (1956). Procedures for sampling salmon for ASL and recording data are presented in Appendices B1 through B6.

The sport and commercial harvests are broadly distributed over space and time, which precludes efficient sampling. Therefore the age composition of the sport-and commercially-caught fish will be approximated by that of fish sampled from the escapement. Because sport and commercial harvests comprise on average less than 10% of the total run, any bias introduced by this approximation will be small.

Subsistence User Survey

Technicians will opportunistically contact sockeye salmon subsistence fishers on the fishing grounds in front of the Buskin River during good weather, and alternatively dockside at the local boat harbor while concurrently sampling the harvest for ASL (Appendix C1). The user survey is a task and has not been designed with bias and precision of the estimates in mind. The survey sample is, however, conducted over the duration of the subsistence fishery, providing a representative sample to a degree. The survey will provide residency and effort data not currently available from the permit returns. Following a set of brief introductory remarks by the technician, all fishers who agree to be interviewed will then be asked a short series of questions to determine their residency (Kodiak Island Borough or other Alaskan) and traditional subsistence fishing location(s) (Buskin River or elsewhere). Interview responses will be recorded on the 2014-2017 Buskin River Sockeye Salmon Subsistence Interview Form (Appendix C2).

Genetic Sampling and Analysis

Tissue samples for genetic analysis will be collected from the mixed-stock sockeye salmon subsistence fishery with the objective (Objective 4) of apportioning Lake Louise and Buskin Lake components of the harvest.

In the absence of genetic error, a sample size of 190 should provide estimates within 7% of the true value 90% of the time, based upon the 'worst-case' parameter value for the multinomial distribution (Thompson 1987). Taking an axillary fin from each fish sampled for ASL (200) should provide a sufficient sample to estimate stock-composition of the harvest. We sampled and successfully analyzed 77, 160, 194 and 314 fish from the harvests in 2010 through 2013, respectively.

Genetic error is lower when stock-composition estimates are calculated among stocks with highly differentiated allele frequencies that are well characterized in the baseline. Recent genetic analyses of samples collected from the Buskin and Louise/Catherine escapement has identified distinct allele frequency differences among these two components. In order to improve estimates of baseline allele frequencies for each reporting group, the Gene Conservation Laboratory (GCL) has requested in 2014 that during the peak of each run, up to an additional 200 genetic samples be collected from each of the Buskin Lake and the Louise Catherine lakes components (400 total). These baseline tissue collections can be the same individuals sampled for ASL and can be preserved in bulk 250ml containers with ethanol. One container will be used for each component (one for Buskin and a different one for Louise/Catherine).

During the subsistence fishery, technicians will opportunistically collect tissues (consisting of Axillary process fin clips) from harvested sockeye salmon also sampled for ASL, either on the fishing grounds or dockside at the local boat harbor. Instructions detailing the collection of genetic material are provided in Appendix D.

Fish collected for this purpose will be analyzed by the ADF&G Gene Conservation Laboratory in Anchorage. Single nucleotide polymorphisms (SNPs) will be used to estimate the stock composition of mixture samples using laboratory methods described by Dann et al. (2012). The stock composition along with 90% credibility intervals will be estimated using BAYES as described by Dann et al. (2012).

Total return

Key to the construction of a brood table and evaluation of the BEG for the Buskin Lake sockeye salmon run is the estimation of total return from a given brood year. Age composition estimates of the total annual run will be used to estimate the total return by brood year and to develop brood tables that will allow investigation of the productivity of the stock.

The four major age classes of sockeye salmon that return to the Buskin River: 1.2, 1.3, 2.2, and 2.3, have historically comprised about 98% of the subsistence and Buskin River escapements. A traditional spawner-recruit analysis using total returns and spawning escapements for brood years 1990 through 2007 determined the estimated spawner level for maximum sustained yield is about 6,200 with an 95% confidence interval of about 5,000 to 8,000 (via bootstrapping of residuals). A Bayesian spawner recruit analysis that used data from the 1990-2013 brood years yielded very similar results. As mentioned, recent work on the number of ages required for brood table construction and spawner recruit analysis (Steve

Fleischmann, Alaska Dept. of Fish and Game, Anchorage) has shown that little in the way of precision is gained once 100 representative ages from a stock in a given year are sampled. This study will sample more than 100 in 2014-2017 from the Buskin stock. Escapement has been measured at the Louise/Catherine system over 12 years. Stock productivity analysis has yet to be conducted for the Louise/Catherine stock. The four major age classes of sockeye salmon thus far returning to Louise/Catherine lakes are 1.2, 1.3, 2.2, and 2.3, which have comprised approximately 90% of the escapement between 2002 and 2013.

COHO SALMON

Run Size Estimation

Ideally, the inriver return of coho salmon will be censused through the lower weir. Operation of the lower weir for coho salmon enumeration will be necessary due to a significant level of spawning activity below Buskin Lake. Target dates of weir operation will be August 1 to September 30. Based on known historic migratory timing, this time frame is assumed to account for roughly 90% of the run.

Fish present behind the weir will be enumerated as they are allowed to migrate upstream. Daily fish counts will be entered on the salmon weir count form (Appendix A1). Completed daily count forms will be maintained both at the weir and the Kodiak SF Division office.

Historically, the sport fishery has comprised the largest removal from the total run. Total sport harvest will be estimated by the Statewide Harvest Survey. A typically small coho salmon commercial harvest assumed to consist of Buskin drainage fish is taken from Women's Bay (ADF&G Kodiak Salmon Statistical Chart area 259-22), near the mouth of Buskin River. Similarly, it is assumed that the subsistence harvest occurring near the river mouth consists principally of local fish. The subsistence harvest of coho salmon (which between 2002 and 2012 has averaged 8% of the run) will be estimated from returned permits.

The lower weir on the Buskin River frequently becomes inoperable due to high water. High water, and loss of weir integrity, has occurred at some point during the coho salmon run almost every year of operation since 1989. Numerous methods have been, and will be used to interpolate counts during flood stages. These methods include direct linear interpolation between days if the flooding period is short, estimation using upper weir counts and the cumulative ratio of lower to upper weir counts prior to flooding, and the use of historic run timing curves. An attempt to account for the errors incurred by these interpolations is made in the Bayesian spawner-recruit analysis by assigning a distribution to the weir counts with a conservative (i.e. large) variance. In this way, the errors propagate through the analysis to the posterior distribution of number of spawners at maximum sustainable yield.

Age-Sex-Length (ASL) Sampling

Escapement Sample Size

To achieve prescribed relative precision and allowing for 20% unageable scales, a minimum of 95 fish will be sampled during each of three 2-week strata at the upper Buskin Lake weir; the upper weir is used due to the frequent flooding experienced at the lower weir**.** By using the upper weir to estimate the ASL composition of the inriver run, we assume that the ASL composition of the sport harvest and of those fish spawning between the lower and upper weir

is the same as that of fish passing through the upper weir. The three strata will occur between August 16-31, September 1-14 and September 15-30, respectively. It is noted that historically less than 1% of the coho salmon run has passed the lower weir before August 15. A tally sheet will be completed to monitor progress toward the attainment of sample goals (Appendix A5).

Sport Harvest

The age-sex composition of the sport harvest will be assumed identical to that of the escapement. (Previous comparisons of age-sex composition between the two sources have not revealed meaningful differences).

Sampling Methodology

Sampled fish length will be measured from mid-eye to fork-of-tail to the nearest millimeter (mm). Sex will be identified based on external morphology and sexual characteristics. Sex and length data will be recorded on an Aceeca™ Meazura MEZ1000 (RDA) (Appendix B5) and downloaded into a Microsoft Access database (Appendix B6) following completion of each day of sampling. A total of four scales will be taken from each fish and mounted on a gum card. The scales will be taken from the left side of the body, at a point on a diagonal line from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin, two rows above the lateral line (Scarnecchia 1979). Scales will be taken proximal to the preferred region when necessary, although only within the area bounded dorsally by the fourth row of scales above the lateral line, ventrally by the lateral line, and between lines drawn vertically from the posterior insertion of the dorsal fin and the anterior insertion of the anal fin. (If no scales are available in the preferred region on the left side of the fish, scales will be collected from the preferred region on the right side.) Age will be interpreted from the scales using procedures described by Mosher (1969). Procedures for sampling salmon for ASL and recording data are presented in Appendices B1 through B6.

Subsistence and commercial harvests are relatively small and logistically difficult to sample, therefore ASL samples will not be collected from these fisheries and age-sex composition will be assumed identical to that of the escapement. Because they contribute only 13% of the total harvest, any bias due to not sampling these fish will be small. Sport harvests will be sampled if sampling at the weir cannot be accomplished, but escapement samples are considered to be representative of the sport harvest as well.

Total return

Using the methods described in this plan that provided inriver run and ASL data from 1989 through 2012, our estimate of escapement at maximum sustainable yield is about 7,000 coho salmon, with an 80% credibility interval of 5,300 to 11,200. We anticipate that the precision of the estimate of this quantity, as well as other biologically meaningful stock recruit parameters to improve as we continue to collect more age and run data.

DATA REDUCTION

PRIMARY DATA CAPTURE

Primary data capture will occur as outlined in the above section, with hard copies of weir counts will be kept both at the weir and in the Kodiak Sport Fish Division office.

SECONDARY DATA CAPTURE

At the conclusion of weir operations all weir counts will be edited and corrected as necessary. Final weir count figures will be entered into the Kodiak Island salmon weir count electronic regional database server maintained by the Kodiak Division of Commercial Fisheries office. Weir count data will also be recorded in a Microsoft Excel spreadsheet.

Age, sex, and length data will be recorded in Microsoft Access© databases. Each species and sample type/location will be recorded into a distinct database. The databases will be uploaded onto a laptop PC© (and also backed up on a flash drive device) shortly following completion of each day of ASL sampling. At the conclusion of weir operations, SF Division personnel will return the laptop PC© to the project manager. The project manager will subsequently edit the electronic ASCII data files for errors, including verification of sample sizes and the plausibility of the size frequency values by species and age class. An age-length-sex summary tables will be prepared for each fishery.

In addition, the daily and cumulative weir counts will be documented in the Kodiak management area, Buskin salmon annual weir report.

ARCHIVING

Final edited copies of all data files will be archived by the Division of Sport Fish in Kodiak. Final escapement figures will be archived in the Kodiak Island salmon escapement electronic regional database server. Electronic files of ASL data and weir counts will also be archived with the final Fishery Data Series report by RTS on Docushare at **http://docushare.sf.adfg.state.ak.us/**; in a standard ASCII format, and a data map will also be archived at this location.

The Excel weir count spreadsheet will have the following fields: Location, Species, Year, Date, Daily Count, and Cumulative Count. The age summary will have fields: Location, Sample Source, Species, Year {Age classes}. The microsatellite genetic data collected will be individual diploid genotypes for each locus.

Archiving will be completed once activities outlined under 'Secondary Data Capture' have been completed, and is expected to be completed by end of Fall 2017/early Winter 2018.

DATA ANALYSIS

SOCKEYE SALMON

Age and Sex Composition-Escapement

The proportion of sockeye salmon of age or sex class *j* in stratum *i* for the escapement will be estimated as a binomial proportion (Cochran 1977) by:

$$\hat{p}_{ij} = \frac{n_{ij}}{n_i}, \tag{1}$$

and its variance by:

$$\text{var}(\hat{p}_{ij}) = \left[\frac{N_i - n_i}{N_i}\right] \frac{\hat{p}_{ij}(1-\hat{p}_{ij})}{n_i - 1}, \tag{2}$$

where:

n_{ij} = the number of sockeye salmon in age or sex class *j* during stratum *i*,

n_i = the total number of sockeye salmon sampled during stratum *i*, and

N_i = the number of sockeye salmon in the weir count during stratum *i*.

The number of fish by age or sex class *j* in stratum *i* was estimated by:

$$\hat{N}_{ij} = N_i \hat{p}_{ij}, \tag{3}$$

and its variance by:

$$\text{var}(\hat{N}_{ij}) = N_i^2 \text{ var}(\hat{p}_{ij}). \tag{4}$$

The estimated total number of sockeye salmon of each age or sex class *j* ($\hat{N}_j$) in the escapement, and its variance [$\text{var}(\hat{N}_j)$], will be calculated as the sum of the individual stratum estimates. The overall proportion of sockeye salmon of age or sex class *j* will be calculated as:

$$\hat{p}_j = \frac{\hat{N}_j}{N}, \tag{5}$$

and its variance estimated as:

$$\text{var}(\hat{p}_j) = \frac{\text{var}(\hat{N}_j)}{N^2}. \tag{6}$$

Age and Sex Composition -Subsistence Harvest

Subsistence harvest estimates cannot be stratified, because subsistence harvest is only reported seasonally with no reliable method of stratification available. Pooled estimates of age and sex composition will, therefore, be calculated using equations 1-4 with deletion of subscript *i*, as was done for un-stratified escapement estimates.

Age and Sex Composition -Sport Harvest

The number of sockeye salmon in the sport harvest by age or sex class *j* will be estimated by:

$$\hat{N}_{SFj} = \hat{N}_{SF} \hat{p}_j, \tag{7}$$

where:

$\hat{N}_{SF}$ = the SWHS estimate of total sport harvest, and

$\hat{p}_j$ = the proportion of age or sex class *j* derived from escapement sampling (sport harvest will not be sampled for age or sex).

The variance of the number of fish in the sport harvest of age or sex class *j* will be estimated according to Goodman (1960):

$$\text{var}(\hat{N}_{SFj}) = \hat{N}_{SF}^2 \text{ var}(\hat{p}_j) + \hat{p}_j^2 \text{ var}(\hat{N}_{SF}) - \text{var}(\hat{p}_j) \text{var}(\hat{N}_{SF}), \tag{8}$$

where:

$\hat{V}\left(\hat{N}_{SF}\right)$ = estimated variance of harvest, estimated from the SWHS.

Assessment of Age-Sex-Sampling Period interactions

Log-linear analysis (e.g. Agresti,1990, p143) on the counts of fish in the three-way age-sex-sampling period contingency table will be used to examine interactions. Models will be chosen based on likelihood ratio tests.

Mean Length at Age

Standard sample summary statistics will be used to calculate estimates of mean length at age and its variance (Cochran, 1977).

Run Size Estimation

Sockeye salmon total run size will be estimated by summing weir counts, permit returns of subsistence harvests, estimated sport harvest and fish ticket tallies of commercial harvests. All components except the sport harvest will be treated as censuses (total counts with zero variance). Harvests from unreturned subsistence permits will be anticipated by assuming a harvest rate that was 65% of the returned permits:

$$\tilde{N}_{SUB} = N_{SUB} + \left[\frac{N_{SUB}}{p_{\mathrm{Re}t}} - N_{SUB} \right] * 0.65 \qquad (9)$$

where:

N_{SUB} = reported subsistence harvest, and

$p_{\mathrm{Re}t}$ = proportion of issued permits returned.

A value of 65% will be assumed reasonable based on estimated harvest rates for unreturned permits in other fisheries in the State of Alaska (0.69 for the Kenai River sockeye salmon dip net fishery and 0.66 for the Chitina sockeye salmon dip net fishery, Patricia Hansen, ADF&G, Anchorage, personal communication). The adjustment is relatively small and no variance component will be calculated.

The number of sockeye salmon of age class *j* in the total run ($\hat{N}_j$) to the Buskin River system and its variance will be estimated by summing the component estimates from the escapement, subsistence harvest and sport harvest, with $\mathrm{var}(\hat{N}_j)$ calculated by summing the respective variances estimates. A covariance will exist between the sport harvest estimate of the age class *j* and the escapement estimates of age class *j* (through $\hat{p}_j$). However, the covariances will be small because the sport harvest is always a relatively small component of the total run.

Exploitation Rate Estimation

Exploitation rates (*E*) for the subsistence and sport fisheries will be estimated as:

$$\hat{E} = \frac{H}{\hat{T}}, \qquad (10)$$

where *H* is either the subsistence harvest or sport harvest estimate and *T is* the total run. The variance estimate of the subsistence exploitation rate will be calculated as:

$$\text{var}(\hat{E}) = H^2 \frac{1}{\hat{T}^4} \text{var}(\hat{T}) . \quad (11)$$

The variance of the sport fish exploitation rate will be estimated as:

$$\text{var}(\hat{E}) = \left(\frac{\hat{H}}{\hat{T}}\right)^2 \left(\frac{\text{var}(\hat{H})}{\hat{H}^2} + \frac{\text{var}(\hat{H})}{\hat{T}^2}\right). \quad (12)$$

Spawner Recruit Analysis

Two different methods will be used to model the spawner-recruitment relationship: a traditional, widely used method that provides an average relationship (Ricker 1975), and a more recently developed Bayesian Markov Chain Monte Carlo method, which, while based on an underlying Ricker-type relationship, is better able to incorporate the uncertainty associated with the various datasets into the estimated relationship (Fleischman et al. 2013)

Subsistence User Survey

Residency and traditional location(s) fished statistics from subsistence user interviews will be summed and tabulated and distributed to the Office of Subsistence Management without further analysis.

Composition of Subsistence Harvest

The proportion of the subsistence harvest comprised of sockeye salmon originating from Buskin Lake versus the Lake Louise/Catherine Lakes will be estimated as:

$$\hat{p}_B = \frac{n_B}{n} \quad (9)$$

and its variance by:

$$\text{var}(\hat{p}_B) = \frac{\hat{p}_B(1-\hat{p}_B)}{n\ -1}, \quad (10)$$

where:

n_B = the number of sockeye salmon determined to be of Buskin Lake origin in the subsistence harvest sample.

n = the number of sockeye salmon subjected to genetic analysis from the subsistence harvest.

Genetic identifiability of the Buskin/Lake Louise stocks has been found to be very high use of the binomial formulas above is believed to be valid.

COHO SALMON

Escapement -Age and Sex Composition

The coho salmon age/sex data will be treated identically to that for the sockeye salmon age/sex data collected at the Buskin Lake outlet weir.

Sport Harvest -Age and Sex Composition

The age-sex composition of the sport harvest will be assumed to be identical to that of the escapement. Previous comparisons of age-sex composition between the two sources have not revealed meaningful differences.

Mean Length at Age

Mean lengths at age and their standard errors will be estimated for each age class of the run.

Run Size Estimation

The number coho salmon of age class j in the overall run and its variance will be estimated by:

$$\hat{N}_j = \left[N_E + N_S + 0.8\hat{N}_{SF}\right]\hat{p}_{E\,j} \qquad (11)$$

where N_E is the escapement through the weir at Bridge #2, N_S is the subsistence harvest, $\hat{N}_{SF}$ is the statewide harvest survey estimate for sport harvest, and $\hat{p}_{Ej}$ is as defined for the sockeye salmon escapement. It is assumed that 80% of the sport harvest occurs downstream of the weir (Murray 1987) (treated as a constant in Equation 12). The variance of $\hat{N}_j$ will be estimated as:

$$\mathrm{var}(\hat{N}_j) = \left[N_E + N_S + 0.8\hat{N}_{SF}\right]^2 \mathrm{var}(\hat{p}_{Ej}) + \hat{p}_{Ej}^2\,\mathrm{var}(\hat{N}_{SF}) - \mathrm{var}(\hat{N}_{SF})\,\mathrm{var}(\hat{p}_{Ej}) \qquad (12)$$

Spawner Recruit Analysis

Two different methods were used to model the spawner-recruitment relationship: a traditional, widely used method that provides an average relationship (Ricker 1975), and a more recently developed Bayesian Markov Chain Monte Carlo method, which, while based on an underlying Ricker-type relationship, is better able to incorporate the uncertainty associated with the various datasets into the estimated relationship (Fleischman et al. 2013)

SCHEDULE

A schedule of tasks to be completed annually between 2014-2017 is as follows:

Install the sockeye weir at the outlet of Buskin Lake	May 16
Install the sockeye weir at the outlet of Lake Louise	June 1
Sample sockeye escapement at Buskin outlet	June 1-End of Sockeye Run
Sample sockeye escapement at Louise outlet	June 1-August 31
Sample sockeye subsistence harvest	June 1-June 30
Interview Buskin drainage sockeye subsistence fishers	June 1-June 30
Collect genetic tissue samples	June 1-June 30
Install weir at lower site on Buskin River	August 1
Sample coho escapement at Buskin River weir	August 16-September 30
Remove weir from Louise outlet	September 15
Remove weir from Buskin outlet	September 30
Remove weir at lower river site	September 30
Ship all genetic samples to GCL	September 30
Kodiak Island Weir Database entry	November 15
2014-2017 genetic samples genotyped in laboratory	November 2017
Scales pressed and aged	December 15
Age-length-size summary tables	February 1
2014-2017 genetic samples statistically analyzed	March 2018

REPORTS

A Fisheries Data Series report will be submitted to OSM in May 2018 summarizing data collected on sockeye salmon returning to the Buskin River in 2014 – 2017, and will also present an updated sockeye salmon stock assessment analysis. A second Fisheries Data Series report will be prepared in early 2018 summarizing data collected on coho salmon returning to the Buskin River in 2014 – 2017. A third Fisheries Data Series report will be prepared in 2014 summarizing data collected on coho salmon returning to the Buskin River in 2011 – 2013. Weir counts and age data will be included in both reports. Collected scale samples will be archived in the Sport Fish office in Kodiak.

BUDGET SUMMARY

Proposed FY15 Costs:

Line Item	Category	Budget ($K)
100	Personal Services	140.0
200	Travel	3.5
300	Contractual	6.5
400	Commodities	11.6
500	Equipment	3.5
Total		128.8

Budget Manager(s): Donn Tracy (Project 2135, Buskin River Sockeye Weir; Project 9461, Buskin River Salmon)

Project Personnel:

PCN	Name	Level	Months	Cost ($K)
4170	Tyler Polum	FB II	4.0	30.9
4230	David Evans	BIOM II	1.0	8.4
4241	Myra Scholze	FWT II	3.0	15.8
4295	Connor Murphy	FWT II	6.0	31.6
Nonperm	(vacant)	FWT II	2.5	7.8
11IN1121	(vacant)	SI II	1.5	4.2
11IN1120	(vacant)	SI II	1.5	4.2
Nonperm	(vacant)	FWT II	2.5	7.8

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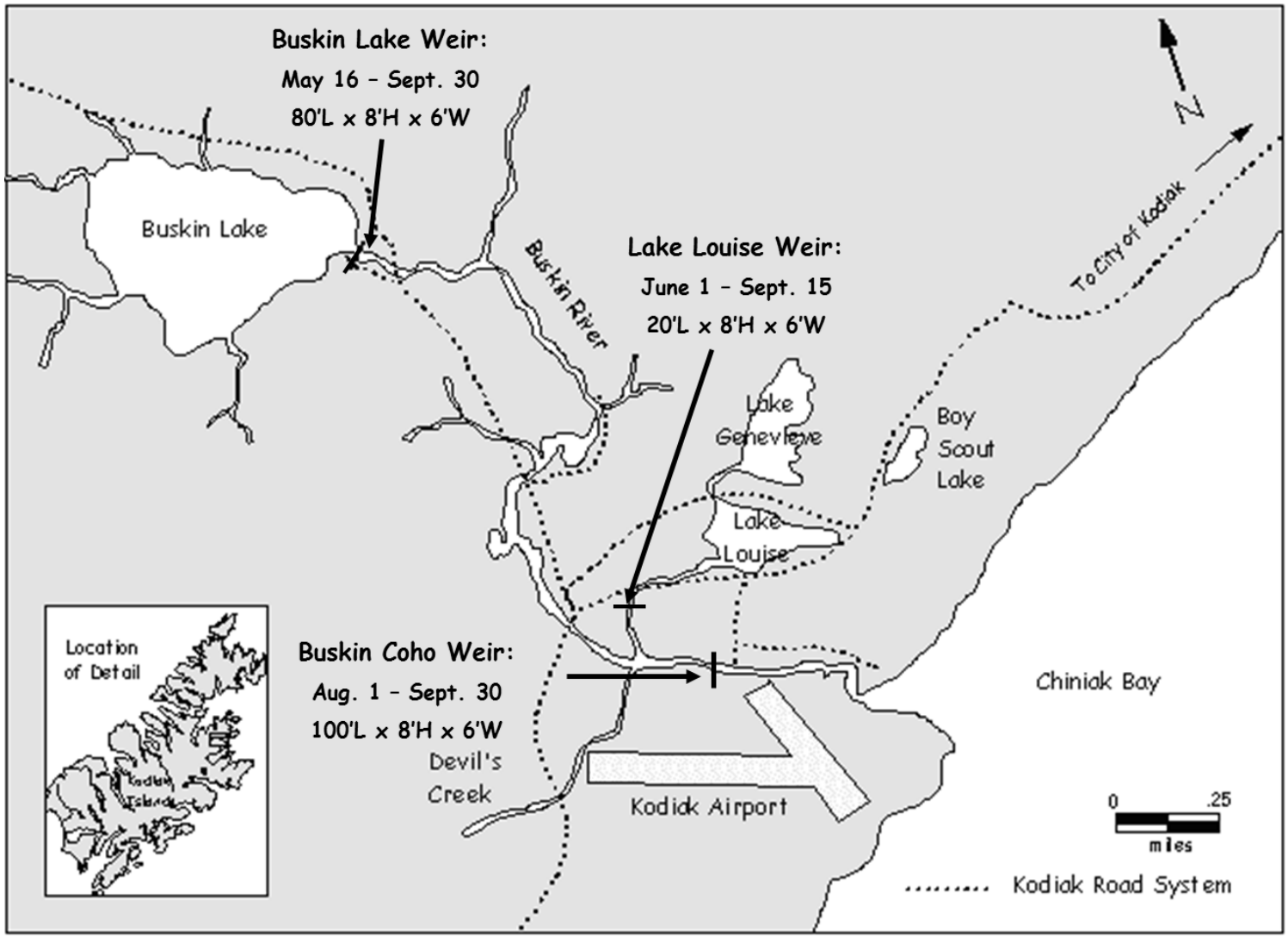


Figure 1. Buskin River, Kodiak Island, including ADF&G weir sites.

APPENDIX A

Escapement and AWL sample goal forms

Appendix A1 Buskin weir project fish count form

Buskin Weir Project Daily Fish Counts Weir Location: **Buskin River/Lake Louise** (circle one)								Date: _____/_____/_____		
Count		Sockeye	Pink	Coho	Chum	Chinook	Dolly Varden		Steelhead	
No.	Time						Down	Up	Down	Up
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
Daily Total										
Cum. Total Yesterday										
Cum. Total Today										

Comments: _____

Water Level (ft.): _____

Water Temp (C°): _____

Weather Conditions: _____

Appendix A2. Buskin Lake outlet sockeye salmon escapement sample goal form.

Year _____ Buskin River Weir Sockeye Salmon Escapement Sampling Goals											
June 1-15			June 16-30			July1-15			July 16-END		
Goal 120			Goal 100			Goal 60			Goal 40		
Date	Sampled	Cum	Date	Sampled	Cum	Date	Sampled	Cum	Date	Sampled	Cum
	Total:			Total:			Total:			Total:	

Appendix A3. Buskin River sockeye salmon subsistence harvest sample goal form

Year _____

June 1-15				**June 16-30**		
Goal - 100				**Goal - 100**		
Date	Sampled	Cumulative		Date	Sampled	Cumulative
	Total:				Total:	

Appendix A4. Lake Louise sockeye salmon escapement sample goal form.

Year _____

June 1- July 15			July 16-31			Aug. 1-15			Aug. 16-31		
Goal	**10**		**Goal**	**10**		**Goal**	**30**		**Goal**	**30**	
Date	Sampled	Cumulative	Date	Sampled	Cumulative	Date	Sampled	Cumulative	Date	Sampled	Cumulative
Total:			**Total:**			**Total:**			**Total:**		

Appendix A5. Buskin River coho salmon escapement sample goal form.

Year _______________

August 16 - 31			**Sept. 1 - 14**			**Sept. 15 - 30**		
Goal - 95			**Goal - 95**			**Goal - 95**		
Date	Sampled	Cumulative	Date	Sampled	Cumulative	Date	Sampled	Cumulative
	Total:			Total:			Total:	

APPENDIX B

Procedures for sampling adult salmon for age, length, and sex; instructions to record age-sex-length data on AWL forms.

Appendix B1. - Procedures for sampling adult salmon for age, length, and sex on the Buskin River.

Annually, salmon escapements are sampled for age (scales), length, and sex by field crews throughout the State. This database is essential for sound management of the State's salmon resources.

To be useful, scale samples must be collected and mounted properly to ensure accurate age determination. In addition, data must be recorded on the age, sex, length optical scanning (AWL) forms neatly and accurately. The following procedures are to be strictly adhered to when sampling adult salmon for age, length, and sex.

General Procedures

1) All age-sex-length data will be recorded in an Aceeca MEZ1000 RDA (RDA) data logger during sampling and subsequently downloaded into a laptop computer that evening.
2) Prior to sampling fish, complete information required on each scale card by recording in pencil the following.

SCALE GUM CARDS

Species

Write out completely (e.g., sockeye).

Card Number

Scale card numbers will be assigned sequentially starting at '001' and continuing to conclusion of the project; the last scale card number assigned will reflect the total number of cards used for collecting samples. NOTE: a different series of cards each beginning with 001 will be collected for each species, location and sample type.

Locality

Include the sampling location followed by "escapement" or "subsistence" (e.g. Buskin River, escapement).

Statistical Area Code

Leave blank.

Sampling date

Fill in the date the fish were sampled.

Gear

Write out completely. (e.g. weir trap or sport fishery.)

Collector(s)

Record the last names of each person collecting the sample.

Remarks

Number of scales per fish sampled.

SAMPLING CHECKLIST

OPERATIONAL PLAN	MEZ1000 RDA (data logger)	SAMPLING TROUGH
GUM CARDS	FORCEPS	PENCILS (NO. 2)
PLASTIC CARD HOLDERS	NEOPRENE WRISTERS	CLOTHS PIN

SAMPLING PROCEDURE

1. Place the fish in the sampling trough filled with water, on its right side to sample the left side.
2. Determine the sex of the fish and record on RDA (Appendix B5). If any difficulty is encountered with this procedure, mark unknown into the data logger and ask your supervisor for help as soon as possible before sexing additional fish.
3. Measure fish length in millimeters from mid eye-to-fork of tail (Appendix B2). Record length on the RDA. Measure all species of salmon to the nearest mm. When collecting length data, take care to ensure that each length corresponds to the appropriate scale mounted on the gum card, as length-at-age is evaluated for each sample.
4. Remove the "preferred scale" from the fish by grasping the scale's exposed posterior edge with forceps and pulling free (Appendix B3). Remove all slime, grit, and skin from the scale (neoprene wristers work well for this). The preferred scale is located on the left side of the fish, two rows above the lateral line on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin. If the preferred scale is missing, select a scale within the preferred area on the other side of the fish. If no scales are present in the preferred area on either side of the fish, sample a scale as close to the preferred area as possible. Do not select a scale located on the lateral line.
5. **When taking multiple scales per fish** after selecting the preferred scale, additional scales are taken from the area labeled 'A' and if insufficient scales are available from area 'A', select the remainder from the adjacent area labeled 'B' (Appendix B3).
6. When sampling sockeye salmon (2 scales per fish), repeat steps 1 through 4 for up to 20 fish per scale card. When sampling coho salmon (4 scales per fish), repeat steps 1 through 4 for up to10 fish per scale card.

Placing Scales on Gummed Cards

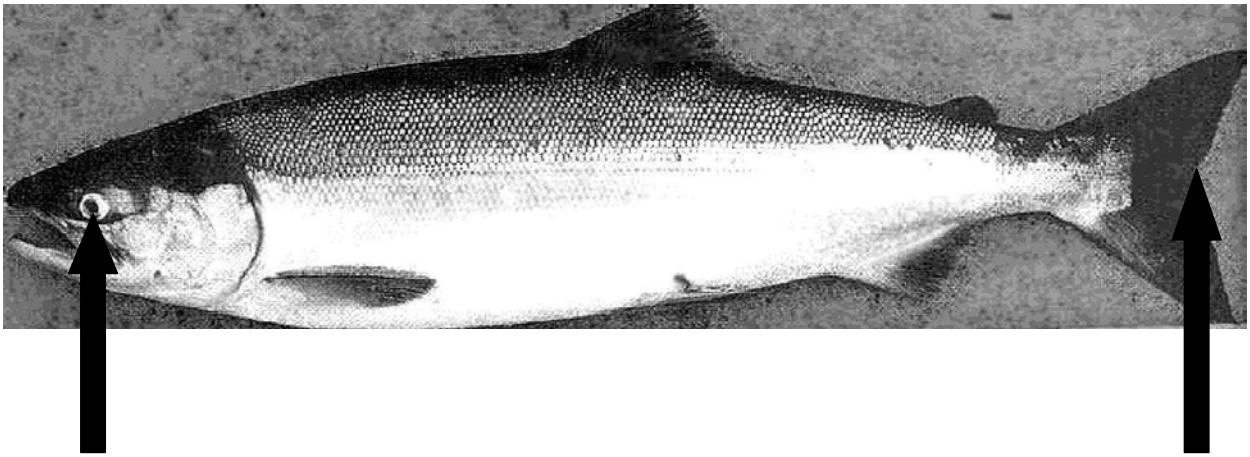
1. It is important to take care that scales adhere to the gum card, rough side up. Therefore, without turning the forceps over, clean, moisten, and mount the scale on the gum card with your thumb or forefinger.
2. Exert just enough pressure to spread and smooth the scales directly over the appropriate sequential number. The ridges on the sculptured side can be felt with a fingernail or forceps.
3. Mount the scale with the anterior end oriented toward top of gum card. All scales should be correctly oriented on the card in the same direction (Appendix B4).
4. Mount multiple scales per fish in vertical alignment on the scale card; e.g., multiple scales from the first fish sampled per scale card are mounted on scale card numbers '1', '11', '21' and '31'; multiple scales from the second fish sampled per scale card are mounted on scale card numbers '2', '12', '22', '32' and so on.
5. Do not put the cards together while wet. Be sure to have plastic acetates to place between gum cards while sampling. Lay the gum card out to dry inside the trailer/cabin. Be careful not to get dirt or sand on the gum cards.

6. After sampling is done for the day, transfer the data from the RDA onto the laptop computer (Appendix B6). Each sampling event will be saved into its own file, named the location, species, and date of the sample (e.g., BuskinSockeyeEsc6209).
7. **Each length, sex, and scale must correspond to a single fish! It is your responsibility to be sure the data has been entered correctly.** Laptop computers and RDA containing length and sex data MUST be returned to the project biologist at the end of the season. These are considered raw data and need to be archived.

Some Reminders

1. For greater efficiency in scale reading, mount scales with anterior end toward top of gum card.
2. Transfer important comments from the gum cards in to the 'Comments' column in the Access database. After pressing scales, the cards are seldom referred to again, and important remarks not previously transferred to the database can be lost.
3. Be careful when collecting and mounting scales in wet conditions (splashing fish, rain, high humidity, etc.). If glue dries on top of the scale, it often obscures scale features, resulting in an unreadable scale. In addition, scales frequently adhere poorly to a wet gum card. Protect the cards and keep them dry to avoid having to remount the scales on a new card. If the cards get wet, try to dry them in a protected area or remount if necessary. Remember; use a pencil when filling out gum cards, because ink will come off during pressing.
4. After a sample has been completed, download the data onto a laptop computer as soon as possible, **preferably on the same day the sampling occurred**. This will ensure more accurate information, as any problems or abnormalities concerning the sample (e.g., many jacks in sample, many fish lacking preferred scale, number of scales do not match number of lengths recorded, etc.) will be fresh in your mind.
5. Responsibility for accuracy lies with the primary data collector(s). Sloppy or incomplete data or gum cards will be returned to individual collectors for correction.

Appendix B2.-Measuring fish length from mid eye to tail fork.



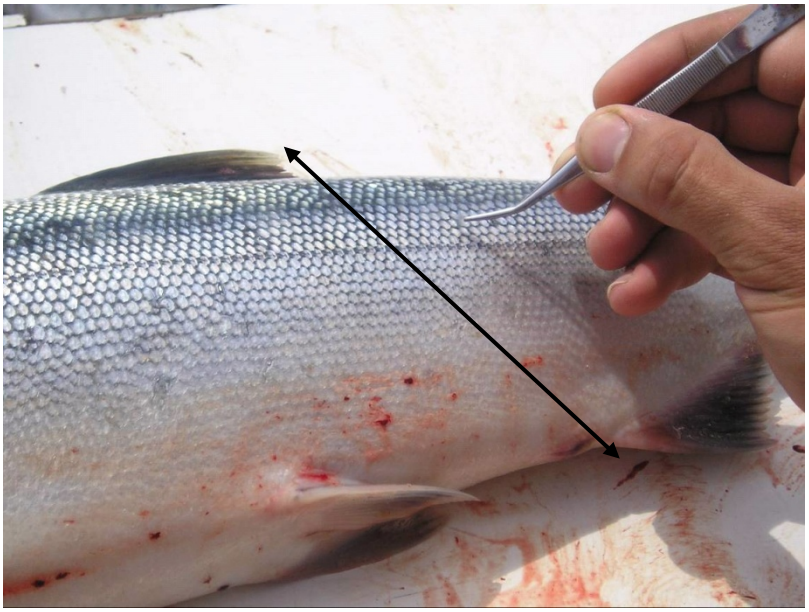
Adult salmon length is measured from mid eye to tail fork because the shape of the salmon's snout changes as it approaches sexual maturity. The procedure for measuring by this method is as follows.

1) Place the salmon flat on its right side (in the sampling trough) with its head to your left and the dorsal fin away from you.

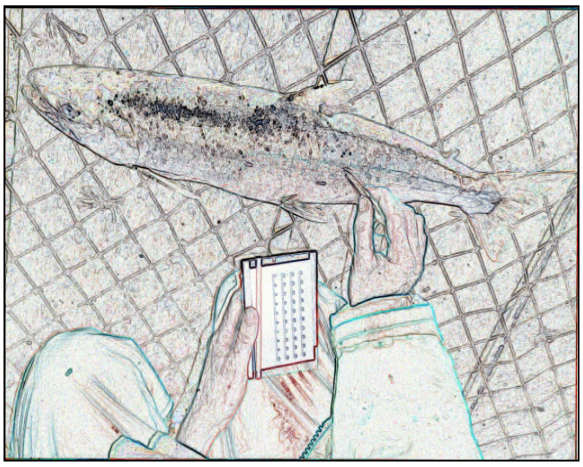
2) Slide the fish in place so that the middle of the eye is in line with the edge of the meter stick and hold the head in place with your left hand.

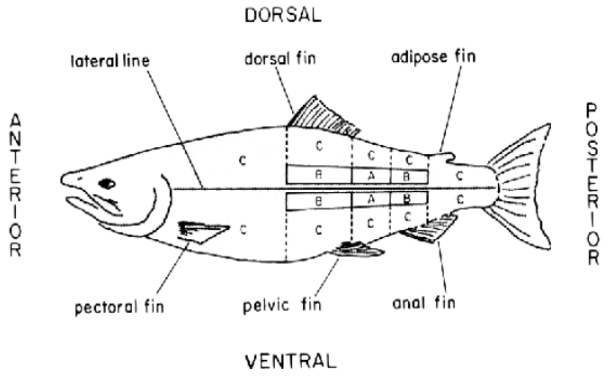
3) Flatten and spread the tail against the board with your right hand.

4) Read and record the mid eye to tail fork length to the nearest millimeter.

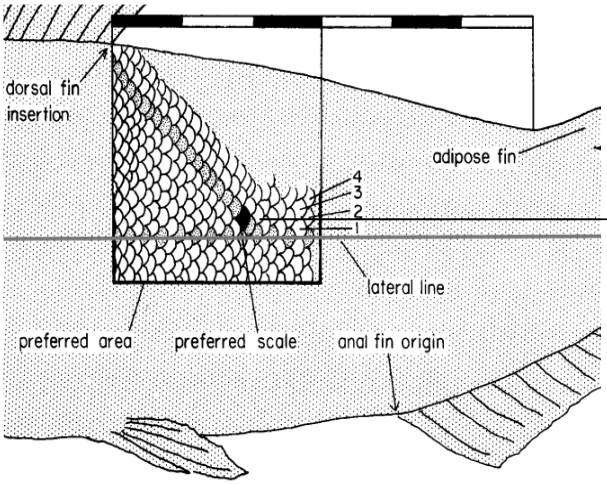


Appendix B3.-Removal and mounting of the preferred salmon scale.

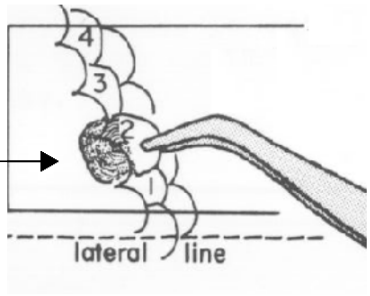


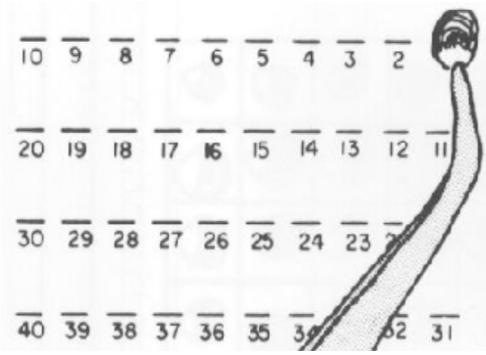


INPFC rated areas for scale removal. Area A is the preferred area. If scales on the left side are missing, try the right side. Area B is the second choice if there are no scales in area A on either side of the fish. Area C designates non preferred areas.



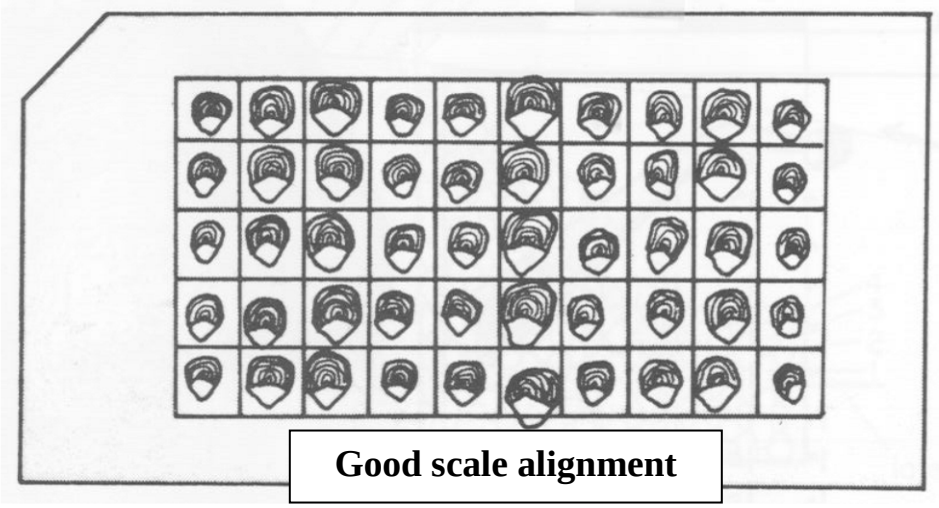
Do not turn scale over.





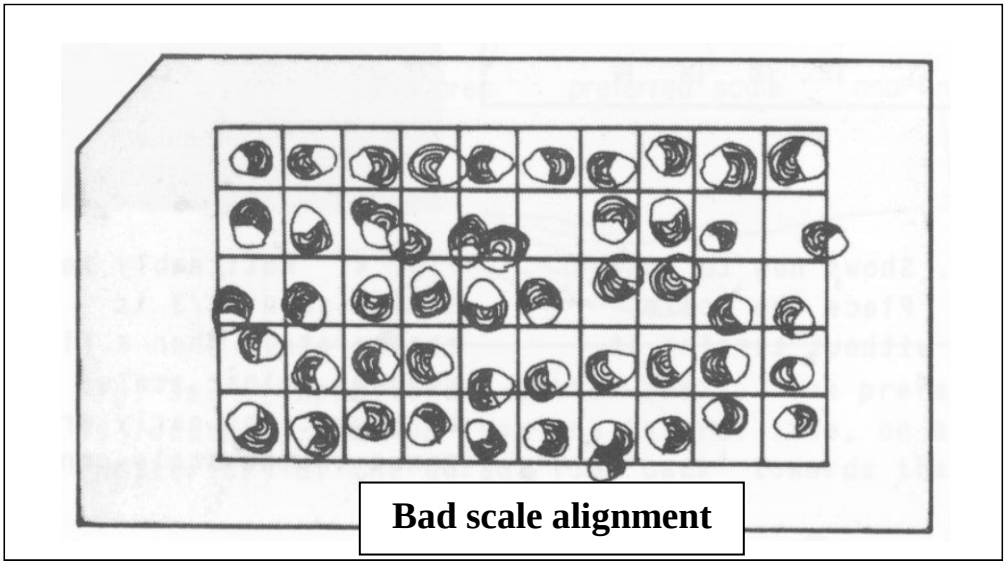
The preferred scale in this diagram is solid black. It is located 2 rows up from the lateral line, on a diagonal from the insertion (posterior) of the dorsal fin "back" toward the origin of the anal fin.

Appendix B4.-Scale orientation on the salmon scale gum card.



Good scale alignment

The scales are all correctly oriented on the card in the same direction, with the anterior portion of the scale pointed toward the top of the card and the posterior portion (which is that portion of the scale held in the forceps) pointed toward the bottom of the card.



Bad scale alignment

The scales are incorrectly oriented in different directions. This increases the time spent to age samples.

Appendix B5.- Instructions to record age-sex-length data onto Meazura MEA1000 (RDA) Buskin River sockeye and coho salmon project.

Entering sample Data into the RDA

At the sampling location:

1) Turn on the RDA.
2) Select ASL by using the down arrow within the TYPE list
3) Select either NEW or PREVIOUS by using the down arrow within the SAMPLING EVENT list.

If this is the first sampling event (i.e., Gum Card # 001) of the season for a particular species, then select NEW.

If it is not the first sampling event, then select PREVIOUS which will enable you to continue to sample in sequential order.

If NEW was selected, then:

a) Select SOCKEYE or COHO by using down arrow within the SPECIES list.
b) Select ESCAPEMENT or SUBSISTENCE by using down arrow within the PROJECT list.
c) Select ADULT by using down arrow within the LIFE STAGE list.
d) Select WEIR TRAP or SUBSISTENCE by using down arrow within the GEAR list.
e) Select BUSKIN or LAKE LOUISE by using down arrow within the AREA list.
f) Select WEIR by using down arrow within the SAMPLE LOCATION list.
g) Select MIDEYE-TO- FORK by using down arrow within the LENGTH MEASUREMENT TYPE.
h) Select 2 or 4 by using down arrow within the NUMBER OF SCALES list.

Regardless if NEW or PREVIOUS was selected, then:

4) Select MONTH by using down arrow within the MONTH list.
5) Select DATE by using down arrow within the DATE list.
6) Select YEAR by using down arrow within the YEAR list.
7) GUM CARD number will be automatically selected by the RDA.
8) FISH NUMBER will be automatically selected by the RDA.
9) Select FEMALE or MALE or UNKNOWN by using down arrow within the SEX list.
10) Enter LENGTH of fish in mm.
11) Select REPEAT if there are more fish to be sampled.
12) Select QUIT once all fish have been sampled.
13) Turn RDA off.

Appendix B6.- Instructions for downloading data from Meazura MEZ1000 RDA to a laptop computer for Buskin sockeye and coho project.

After each sampling event (every day fish are sampled or angler interviews conducted), all data will be downloaded from the RDA and imported into a Microsoft Access© database on the laptop computer. HotSync© technology allows the exchange and update of data (synchronize) between the RDA and a laptop computer. The HotSync© process automatically synchronizes data between the RDA and the computer. Changes made on the RDA or the computer appear in both places after a HotSync© operation. After sampling is done for the day, transfer the data from the RDA onto the laptop computer. Each sampling event will be saved into its own file, named the location, species, and date of the sample (e.g., LakeLouiseSockeyeEsc6209 or BuskinCohoEsc6209).

Downloading the RDA

After sampling is completed, data recorded on the RDA will need to be downloaded. Follow the steps below to correctly download sample data.

1) Ensure the RDA is completely dry.
2) Turn off the laptop computer.
3) Plug the (communication cable) USB from the RDA into the serial port on your laptop.
4) Turn on the computer.
5) Click the HotSync Manager icon in the windows system tray.
6) Choose Setup.
7) Click the General tab and select 'Always Available'.
8) Click the Local tab. DO NOT change the Serial port.
9) Speed: select As Fast As Possible
10) Click OK
11) DO NOT delete/purge the data from the RDA.

The RDA batteries should last approximately 60 hours. The battery will recharge itself while attached to the laptop computer.

Field project crew leaders will be responsible for copying the complete database onto a jump stick. The jump stick along with the most recent gum cards will be given to the project biologist weekly. This process is designed to leave a full copy of the sample data on the RDA and on the field computer to prevent lost data.

RDA equipment checklist

- ✓ Meazura MEZ1000 RDA (1)
- ✓ Stylus (4)
- ✓ Communication cable (RDA to PC)
- ✓ Micron laptop computer
- ✓ Computer Power cable

APPENDIX C

Buskin drainage sockeye salmon subsistence fisher interview instructions and data sheet

Appendix C1.- Instructions to interview Buskin drainage sockeye salmon subsistence fishers.

All fishers will be interviewed on the fishing grounds in front of the Buskin River with a boat during good weather, and alternatively dockside at the local boat harbor. All head of household subsistence users will be interviewed individually. The purpose of the interviews is to conduct a survey of residency and traditional fishing locations. Interview questions will address the following:

1) **Residency – Kodiak (Kodiak Island Borough) or Alaskan non-Kodiak resident;**
2) **Location of traditional sockeye salmon subsistence fishing effort;**
3) **Length of time (in years) fishing in traditional location;**
4) **Location of other sockeye fishing efforts.**

Appendix C2.- Buskin drainage sockeye salmon subsistence fishers interview datasheet.

Date:	Interviewer:		
Residency?		Kodiak	Alaskan
Location of traditional sockeye salmon subsistence fishing effort?		____________________	
How long (in years)? ____________________			
Do you subsistence fish in other areas for sockeye salmon?		Yes	No
If so, where? ____________________			

Date:	Interviewer:		
Residency?		Kodiak	Alaskan
Location of traditional sockeye salmon subsistence fishing effort?		____________________	
How long (in years)? ____________________			
Do you subsistence fish in other areas for sockeye salmon?		Yes	No
If so, where? ____________________			

Date:	Interviewer:		
Residency?		Kodiak	Alaskan
Location of traditional sockeye salmon subsistence fishing effort?		____________________	
How long (in years)? ____________________			
Do you subsistence fish in other areas for sockeye salmon?		Yes	No
If so, where? ____________________			

Date:	Interviewer:		
Residency?		Kodiak	Alaskan
Location of traditional sockeye salmon subsistence fishing effort?		____________________	
How long (in years)? ____________________			
Do you subsistence fish in other areas for sockeye salmon?		Yes	No
If so, where? ____________________			

Date:	Interviewer:		
Residency?		Kodiak	Alaskan
Location of traditional sockeye salmon subsistence fishing effort?		____________________	
How long (in years)? ____________________			
Do you subsistence fish in other areas for sockeye salmon?		Yes	No
If so, where? ____________________			

APPENDIX D

Instructions for Collection of Axillary Process Tissue Samples for DNA Analysis

Appendix D1.- Instructions for Collection of Axillary Process Tissue Samples for DNA Analysis, ADF&G Gene Conservation Lab, Anchorage.

Non-lethal Sampling Finfish Tissue for DNA Analysis

ADF&G Gene Conservation Lab, Anchorage

I. GENERAL INFORMATION

We use axillary tissue samples from individual fish to determine the genetic characteristics and profile of a particular run or stock of fish. The most important thing to remember in collecting samples is that **only quality tissue samples give quality results**. If sampling from carcasses: tissues need to be as "fresh" and as cold as possible and recently moribund, do not sample from fungal fins.

Preservative used: Isopropanol/Methanol/Ethanol (EtOH) preserves tissues for later DNA extraction. Avoid extended contact with skin.

II. SAMPLING METHOD

- Wipe excess water and/or slime off the axillary process "spine" prior to sampling to avoid getting either water or fish slime into the 2.0ml vial (see diagram).

- Prior to sampling, fill the tubes half way with EtOH. Fill only the tubes that you will use for each sampling period. The squirt bottle is for day use only since it will leak overnight when unattended.

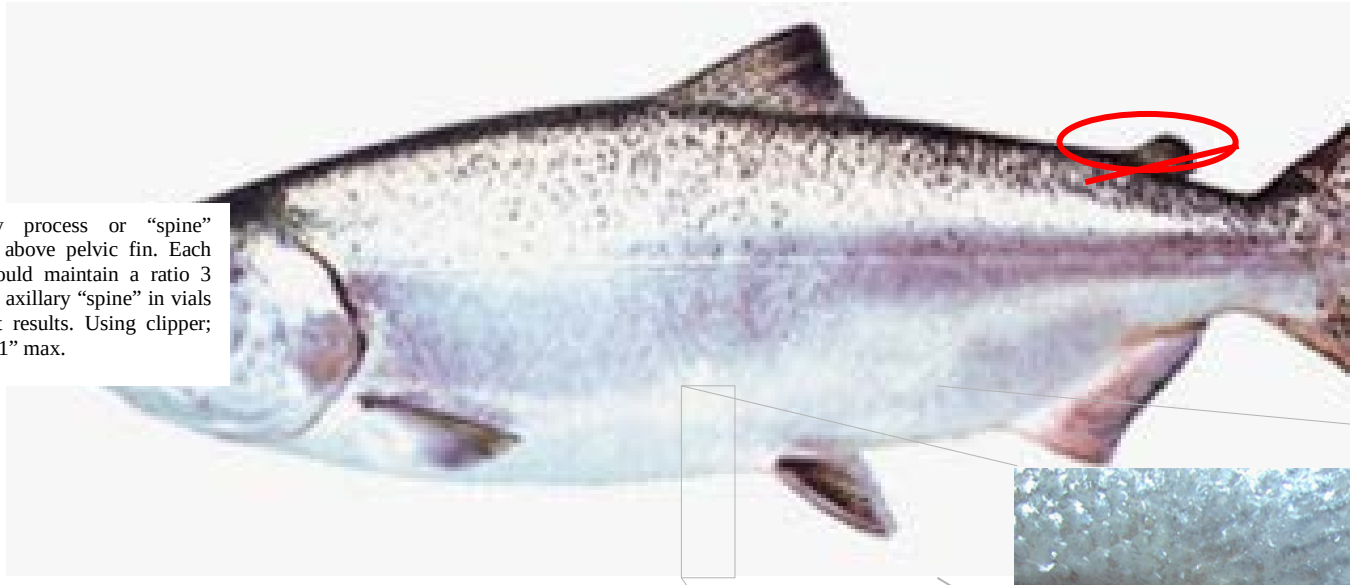
- Clip off the axillary "spine" using dog nail clippers or scissors to get roughly a **½ - 1" inch maximum** piece and/or about the size of a small fingernail.

- Place axillary process into EtOH. The ethanol/tissue ratio should be **slightly less than 3:1** to thoroughly soak the tissue in the buffer.

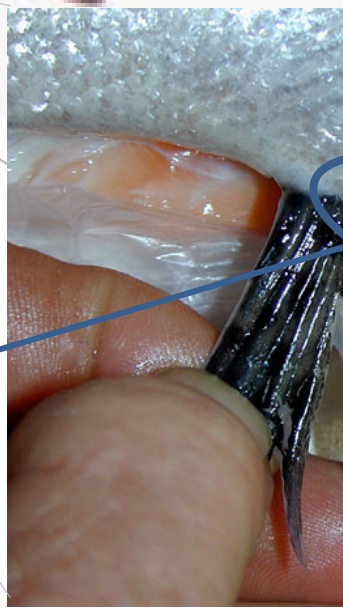
- Top up tubes with EtOH and screw cap on securely. Invert tube twice to mix EtOH and tissue. Periodically, wipe or rinse the clippers with water so not to cross contaminate samples.

- Data to record: Record **each vial number to paired data** information (i.e. location, lat./long., sample date(s), etc.). Electronic version preferred.

- Discard remaining ethanol from the 500ml bottles before shipping. **Tissue samples must remain in 2ml EtOH**, these small quantities require HAZMAT paperwork. Please follow packing instructions for HAZMAT items. Store vials containing tissues at room



Axillary process or “spine” located above pelvic fin. Each clip should maintain a ratio 3 EtOH/1 axillary “spine” in vials for best results. Using clipper; cut ½ - 1” max.



Axillary process or “spine” located above pelvic fin. Each clip should maintain a ratio 3 EtOH/1 axillary “spine” in vials for best results. Using clipper, cut ½-1” max.

III. Supplies included with sampling kit:

1. Dog toe nail clipper - for cutting a portion of the axillary process.
2. Cryovials - 2.0ml pre-labeled plastic vial or tube.
3. Caps – cap for each vial.
4. Cryovial rack- white plastic rack with holes for holding cryovials while sampling.
5. Ethanol (EtOH) – in Nalgene bottle(s).
6. Squirt bottle – to fill and/or "top off" each cryovial with EtOH
7. Laminated "return address" labels
8. Sampling instructions

IV. **SHIPPING:** HAZMAT PAPERWORK IS REQUIRED FOR RETURN SHIPMENT OF THESE SAMPLES.